

BATWING

FX TYPE: Filter

Based on the Maestro® Filter, Sample & Hold™

Enclosure Size: 125B

Softie compatibility: none

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Overview

The **Sharkfin** was a Maestro FSH project available on madbeanpedals for many years. That project seemed to reach the end of its life cycle after a time and was discontinued. But, several builders had mentioned that they might like a project of just the envelope filter portion. The **Batwing** project was created for just that purpose.

The Batwing retains the entire envelope section of the FSH and borrows the filter direction mod from the older Tonepad project. A few minor tweaks were made to the circuit, as well:

- The input buffer from the OTA has been replaced with a JFET.
- A dual-gang 1MB pot is used instead of a single 2MB pot for the REZ control.
- The Decay range is increased.
- A volume control has been added.

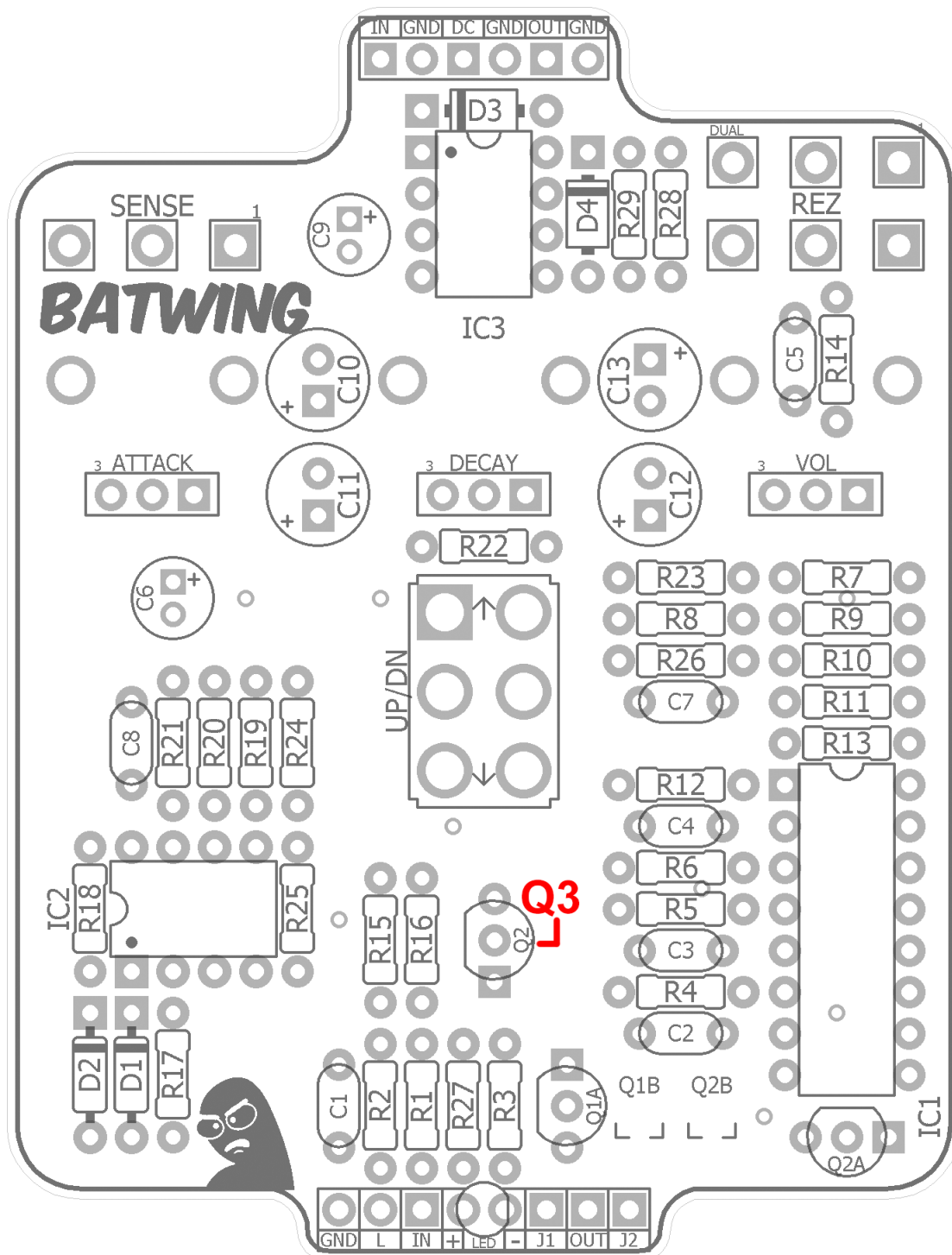
Controls

- **SENSE** - Sets the overall sensitivity of the envelope follower which drives the swept filter.
- **REZ** - Sets the resonance peak of the filter.
- **ATTACK** - CCW: slow envelope attack, CW: fast attack.
- **DECAY** - CCW: very short envelope decay, CW: extremely long decay.
- **VOL** - Effect output level. The nominal output of the Batwing is basically unity. The volume pot was added because some high REZ settings cause a pretty sharp volume spike. So, with those settings you have the option to turn the volume down. Most of the time, you will leave it all the way up.
- **UP/DN** - Sets the direction of the swept envelope in either an upward or downward trajectory.

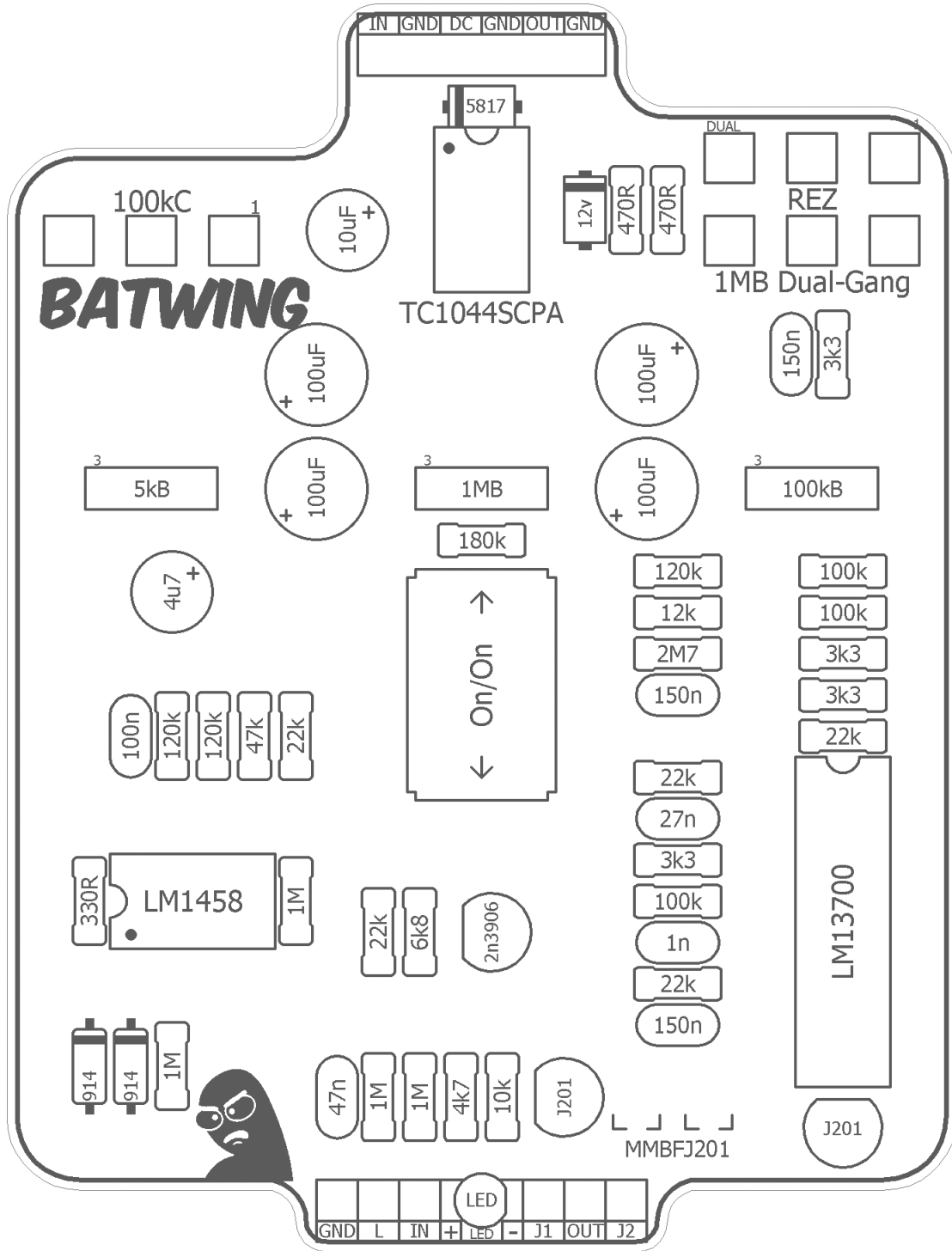
Important Note: The 1MB dual-gang I used for this project looks to have recently gone out of stock at Tayda. I'll show some alternative approaches in the Notes section.

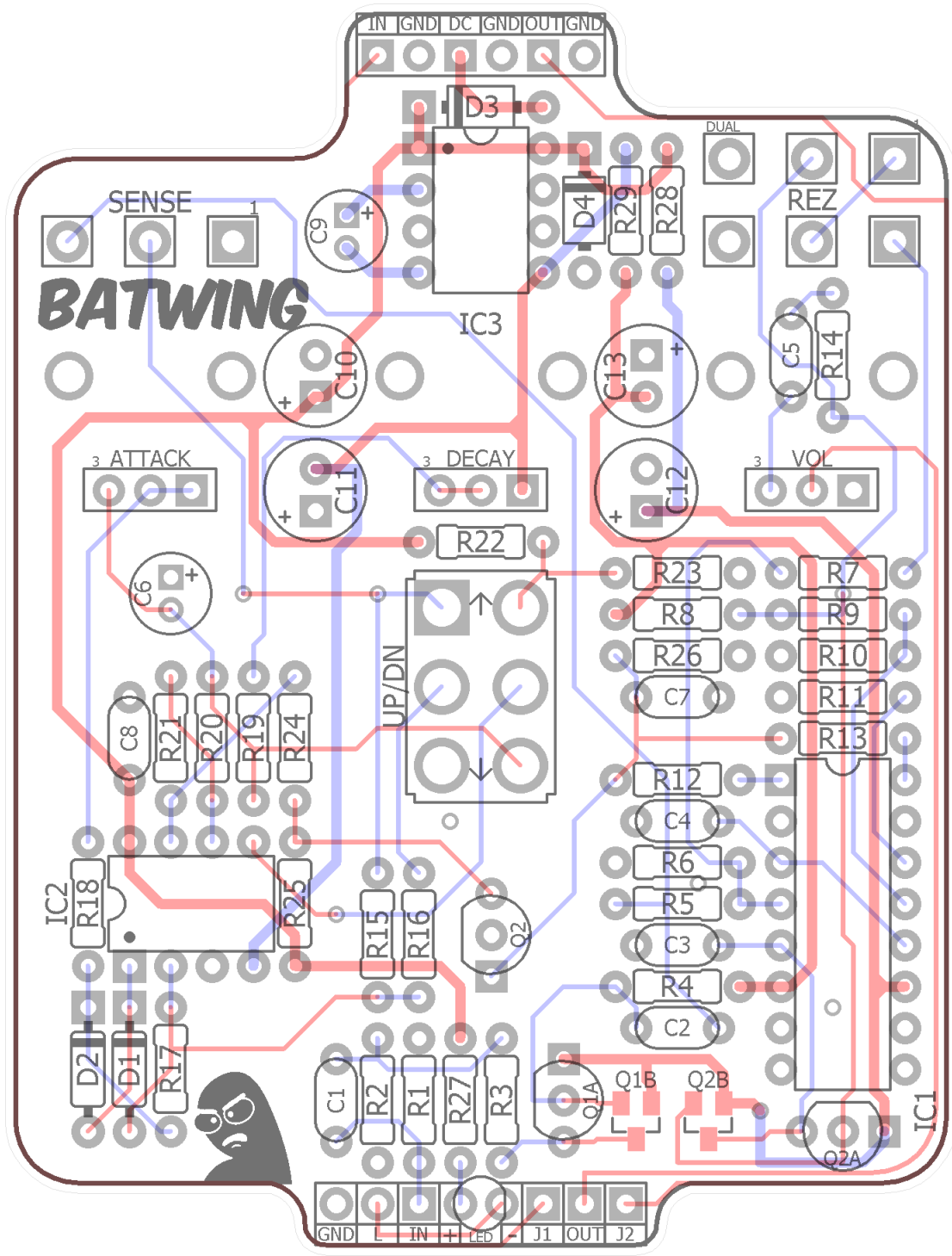
Terms of Use: You are free to use purchased **Batwing** circuit boards for both DIY and small commercial operations. You may not offer **Batwing** PCBs for resale or as part of a "kit" in a commercial fashion. Peer to peer re-sale is fine, though.

Technical assistance for your build(s) is available via the [madbeanpedals forum](http://madbeanpedals.com). Please go there rather than emailing me for assistance on builds. This is because (1) I'm not always available to respond via email in a timely and continuous manner, and (2) posting technical problems and solutions in the forum creates a record from which other members may benefit.



Note: “Q2” is mislabeled on the PCB. It should say Q3. Q2 is a J201 (where Q2a is the through-hole version and Q2b is its surface mount counter-part to give the builder the option of either). **Make sure you put the 2n3906 transistor in the “Q3” spot as shown above.**





Resistors		Caps		Diodes	
R1	1M	C1	47n	D1	1n914
R2	1M	C2	150n	D2	1n914
R3	10k	C3	1n	D3	1n5817
R4	22k	C4	27n	D4	12v Zener
R5	100k	C5	150n	Transistors	
R6	3k3	C6	4u7	Q1	J201
R7	100k	C7	150n	Q2	J201
R8	12k	C8	100n	"Q3"	2n3906
R9	100k	C9	10uF	ICs	
R10	3k3	C10	100uF	IC1	LM13700
R11	3k3	C11	100uF	IC2	LM1458
R12	22k	C12	100uF	IC3	TC1044SCPA
R13	22k	C13	100uF	Switches	
R14	3k3			UP/DN	On/On
R15	22k			Pots	
R16	6k8			SENSE	100kC
R17	1M			REZ	1MB - Dual Gang
R18	330R			ATTACK	5kB
R19	47k			VOL	100kB
R20	120k			DECAY	1MB
R21	120k				
R22	180k				
R23	120k				
R24	22k				
R25	1M				
R26	2M7				
R27	4k7				
R28	470R				
R29	470R				

Values	QTY	Type	Rating
330R	1	Metal / Carbon Film	1/4W
470R	2	Metal / Carbon Film	1/4W
3k3	4	Metal / Carbon Film	1/4W
4k7	1	Metal / Carbon Film	1/4W
6k8	1	Metal / Carbon Film	1/4W
10k	1	Metal / Carbon Film	1/4W
12k	1	Metal / Carbon Film	1/4W
22k	5	Metal / Carbon Film	1/4W
47k	1	Metal / Carbon Film	1/4W
100k	3	Metal / Carbon Film	1/4W
120k	3	Metal / Carbon Film	1/4W
180k	1	Metal / Carbon Film	1/4W
1M	4	Metal / Carbon Film	1/4W
2M7	1	Metal / Carbon Film	1/4W
1n	1	Film	16v min.
27n	1	Film	16v min.
47n	1	Film	16v min.
100n	1	Film	16v min.
150n	3	Film	16v min.
4u7	1	Electrolytic	16v min.
10uF	1	Electrolytic	16v min.
100uF	4	Electrolytic	16v min.
1n914	2		
1n5817	1		
Zener	1	12v	1W
J201	2	through-hole or surface mount	
2n3906	1		
LM13700	1		
LM1458	1		
TC1044SCPA	1		
DPDT	1	On/On, solder lugs	
100kC	1	PCB Right Angle	16mm
1MB	1	PCB Right Angle, Dual-Gang	16mm
5kB	1	PCB Right Angle, Plastic Shaft	9mm
100kB	1	PCB Right Angle, Plastic Shaft	9mm
1MB	1	PCB Right Angle, Plastic Shaft	9mm

MPF102 (Sub for J201):

<https://stompboxparts.com/semiconductors/mpf102-jfet-nos-fairchild/>

MMBFJ201 (surface mount version):

<https://www.mouser.com/ProductDetail/512-MMBFJ201>

12v Zener:

<https://stompboxparts.com/semiconductors/1n4742a-zener-diode-12-1v/>

<https://www.taydaelectronics.com/diodes/zener/1n4742a-1n4742-zener-diode-1w-12v.html>

<https://www.mouser.com/ProductDetail/512-1N4742A>

LM13700:

<https://www.taydaelectronics.com/lm13700-lm13700n-operational-amplifier-ic.html>

<https://www.mouser.com/ProductDetail/926-LM13700N-NOPB>

LM1458:

<https://stompboxparts.com/semiconductors/lm1458n-dual-op-amp-ic/>

<https://www.mouser.com/ProductDetail/595-MC1458P>

TC1044SCPA:

<https://stompboxparts.com/semiconductors/tc1044scca-charge-pump-ic/>

<https://www.mouser.com/ProductDetail/579-TC1044SCPA>

DPDT:

<https://lovemyswitches.com/dpdt-on-on-switch-solder-lug-short-shaft/>

<https://stompboxparts.com/switches/dpdt-toggle-switch-on-on-solder-lug-short-bat-1/>

9mm pots:

<https://www.taydaelectronics.com/b5k-ohm-linear-taper-potentiometer-round-knurled-plastic-shaft-pcb-9mm.html>

<https://www.taydaelectronics.com/100k-ohm-linear-taper-potentiometer-round-knurled-plastic-shaft-pcb-9mm.html>

<https://www.taydaelectronics.com/1m-ohm-linear-taper-potentiometer-round-knurled-plastic-shaft-pcb-9mm.html>

1MB Dual-Gang pot:

<https://www.taydaelectronics.com/pb-1m-ohm-linear-dual-taper-potentiometer-pc-mount-round-shaft-l.html>

Other 16mm Pots:

<https://stompboxparts.com/pots/16mm-potentiometer-smooth-shaft-short-pcb-leg/>

<https://lovemyswitches.com/16mm-potentiometers-1-4-smooth-shaft-right-angle-pcb-mount/>

Low Profile DC Jack:

<https://stompboxparts.com/power-connections/dc-power-jack-2-1mm-low-profile/>

<https://lovemyswitches.com/thinline-lumberg-dc-power-jack-2-1mm/>

Mono 1/4" jacks:

<https://stompboxparts.com/audio-jacks/>

<https://lovemyswitches.com/categories/1-4-jacks-and-cables/mono-jacks.html>

My preferred 3PDT switch:

<https://lovemyswitches.com/pro-3pdt-latched-foot-switch-solder-lugs-feather-soft-click/>

Stompboxparts "Essentials" kit:

<https://stompboxparts.com/jacks/the-essentials-hardware-pack/>

Dialing in the Batwing

Finding settings on the Batwing takes some experimentation. There are certain “sweet spots” that produce excellent envelope response. Because some of the envelope circuit has been made into external controls and the down direction has been added, some control settings may not produce much effect at all. And, the settings that work in the “Up” position tend not to cross over well to the “Down” position.

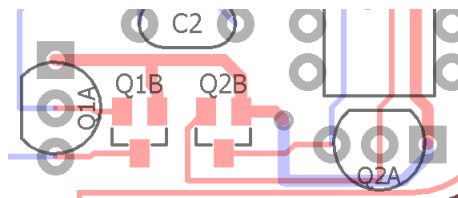
The Up position is the stock direction for the FSH and is the more forgiving of the two. The best settings tend to fall in these ranges: Sense:30-70%, Attack 40-70%, Rez 50-100% and Decay as desired. For the Down position, the range of controls is more limited. I found these to work pretty well: Sense: 70-100%, Attack 50-100%, Rez 50-100% and Decay as desired.

I made one change to the Tonepad “Down” direction mod. In their mod, R16 (my schematic) is 1k2. I found I liked the response better by using something closer to 6k8. This would be the one part I recommend socketing. Try the 1k2 and 6k8 resp. to see if you come to the same conclusion. Or, perhaps in-between or slightly higher. Too high, and the control range with the Sense pot simply gets too narrow and unresponsive.

Once you get it dialed in, the filter is *excellent*. This may be in part due to the bi-polar power which most modern envelopes do not utilize. I think ditching the internal buffers of the OTA and replacing them with JFETs also helped with the very focused tone it produces.

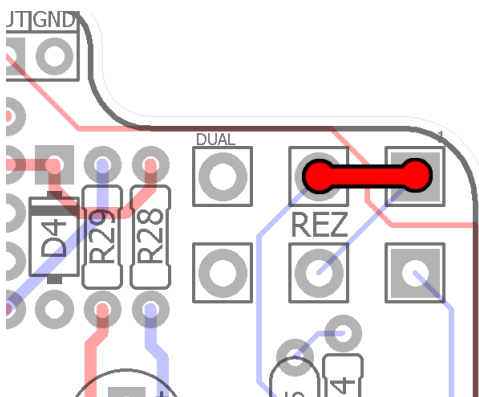
JFETs

The Batwing allows you to use either through-hole or surface mount JFETs for Q1 and Q2 (remember that the transistor labeled Q2 on the board is actually Q3 and should be a 2n3906). For the last year or so, I've been using MMBFJ201 surface mount for most of my builds.



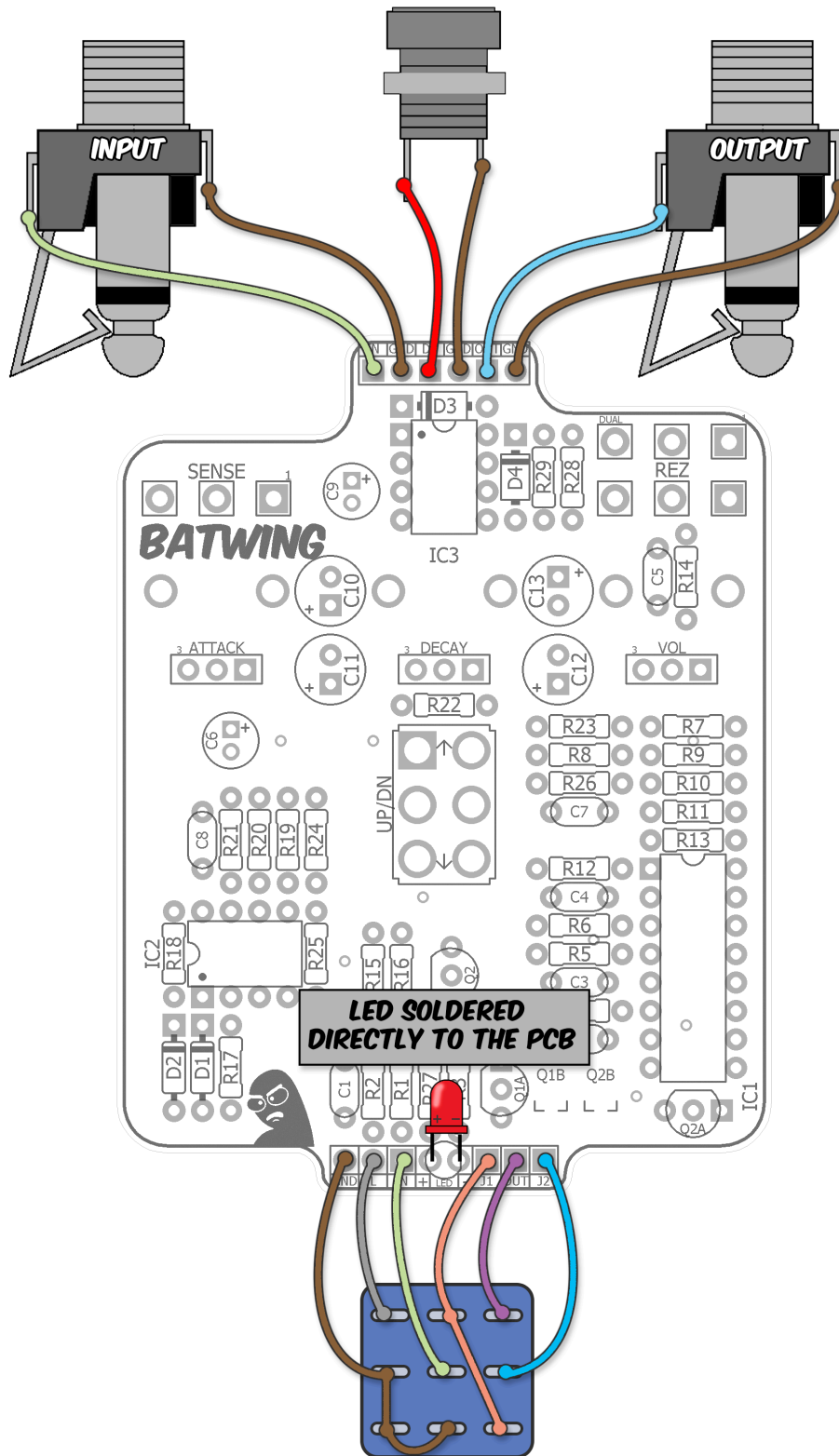
Dual-Gang Alternatives

Unfortunately, the dual 1MB I thought I was so clever to use in this project went out of stock at Tayda some weeks before this release. I don't know when or if it will come back into stock at this point. But, there are a couple possible workarounds. One is simply to use a 2MB single gang pot if you happen to have one. You can use either a PCB pin or solder lug version in that case. But, they are about as rare as the dual-gang 1MB. The other option is to use a 1MB single gang pot and add a resistor in series with it. Since most of the useful range of the REZ pot is in the 40-80% range we can approximate that with a series resistor.

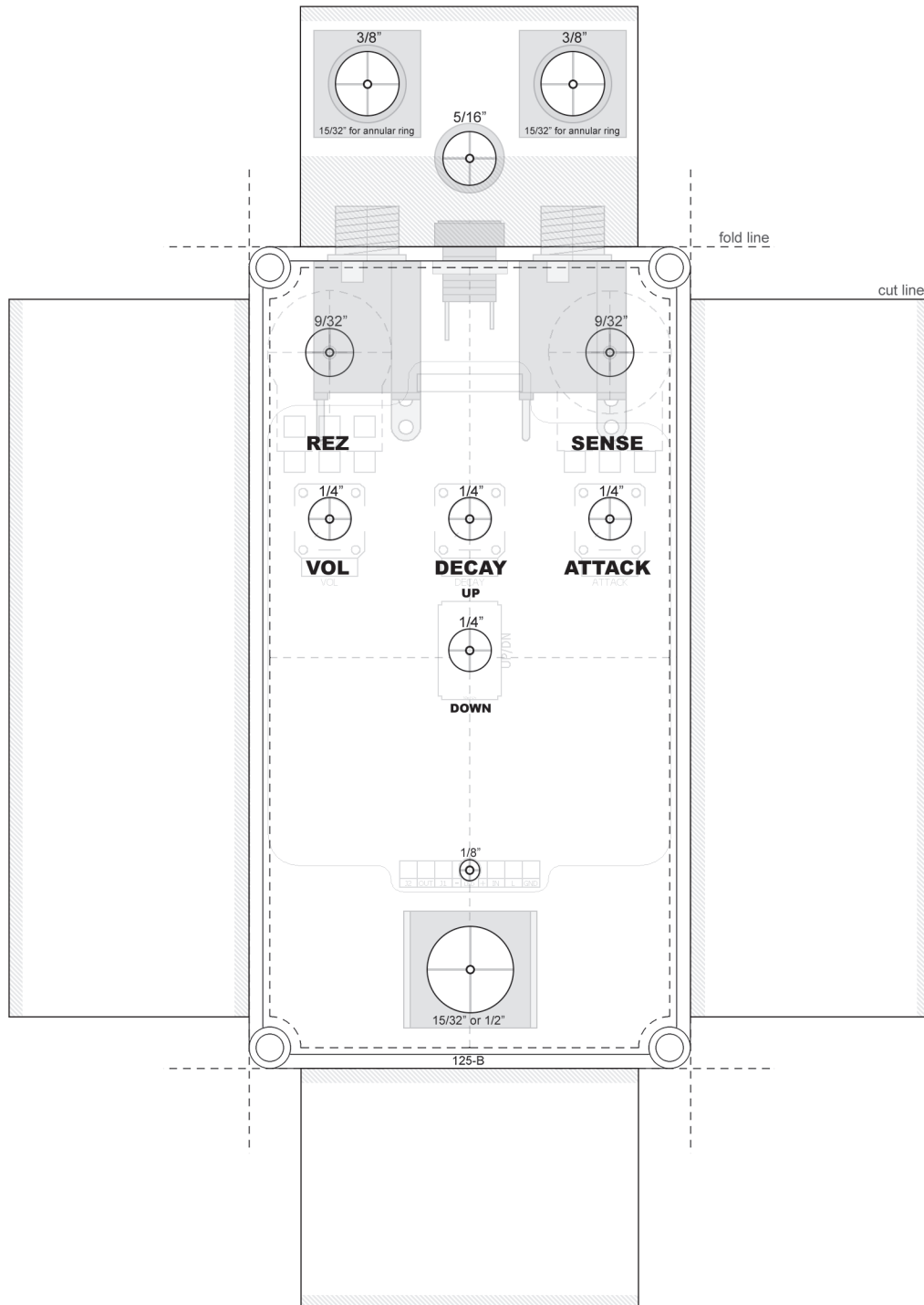


If subbing a single gang pot, solder it to the bottom row of the REZ pot.

- For a 2MB pot, use a jumper in the area marked in red.
- For a 1MB pot, use a 330k resistor (instead of a jumper) across those same pads to goose it into the most useful range.



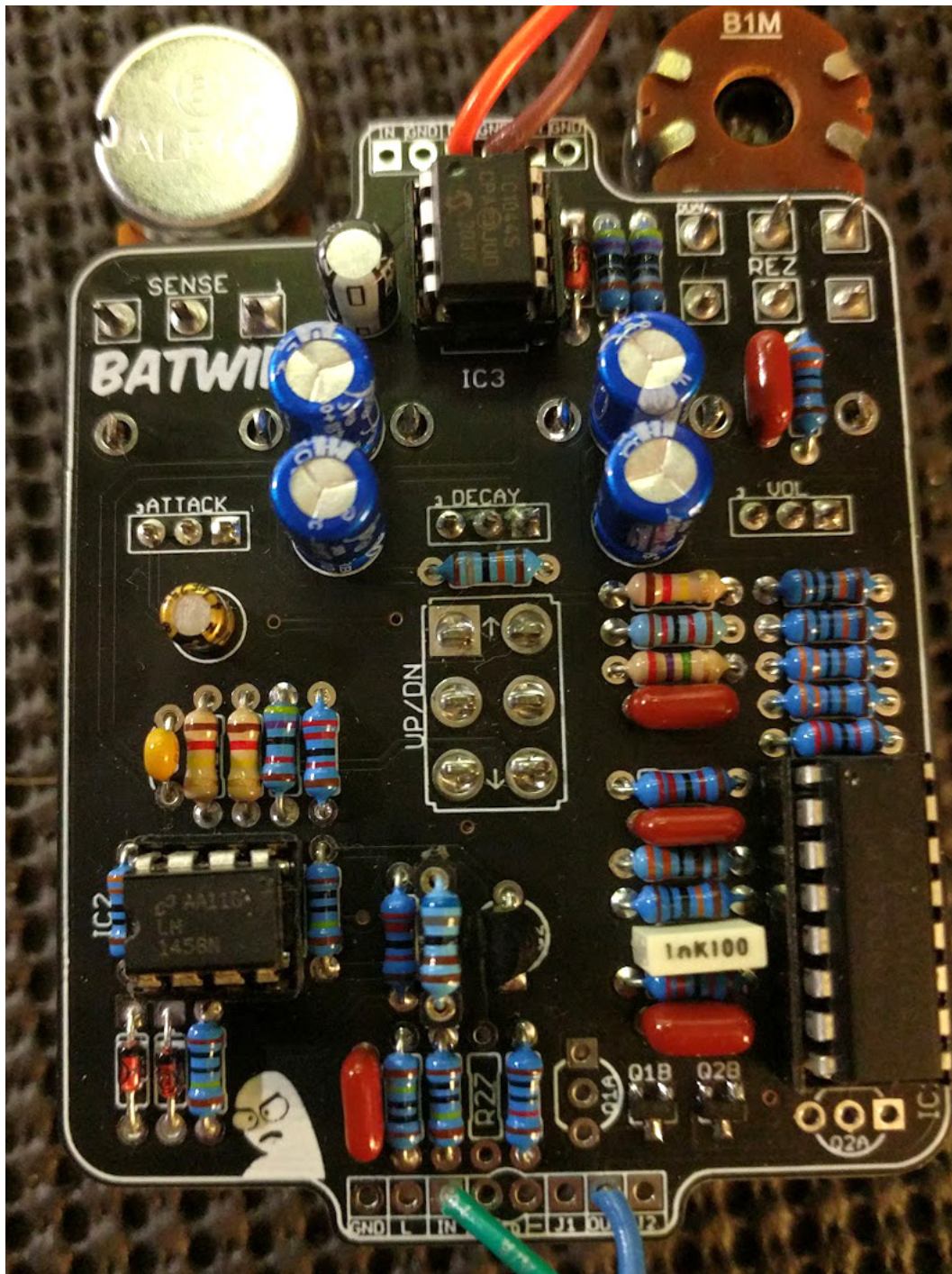
Note: Drill Guides are approximate and may require tweaking depending on the types of jacks, switches and pots you use.

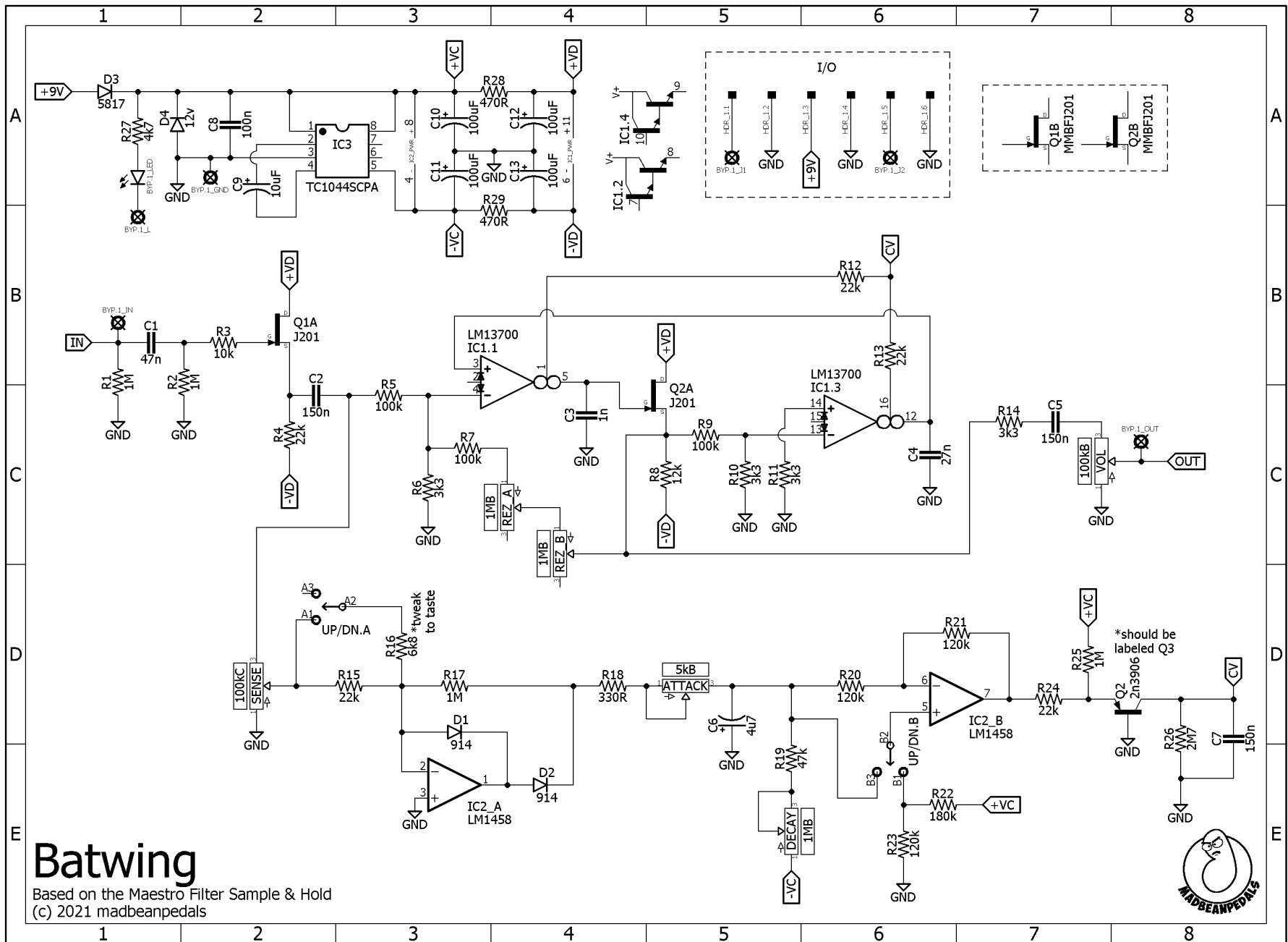


The Batwing is slightly too large to comfortably use any of the Softie bypass boards. I suggest sticking with 3PDT bypass, or using a different relay-based bypass if you prefer.

Q1	J201	IC1	LM13700	IC2	LM1458
D	8.7	1	-7.29	1	~380mV
S	251mV	2	~-2.3	2	0
G	-13mV	3	0	3	0
		4	0	4	-9.06
Q2	J201	5	-17mV	5	~1.5
D	8.7	6	-8.5	6	~1.9
S	-23mV	7	ignore	7	~1.37
G	-18mV	8	ignore	8	9.25
		9	ignore		
Q3	2n3906	10	ignore	IC3	TC1044
C	-6.3	11	8.7	1	9.25
B	0	12	0	2	5.36
E	566mV	13	0	3	0
		14	0	4	-3.79
		15	-0.62	5	-9.06
		16	-7.27	6	4.3
				7	5.71
				8	9.25

- 9.42vDC One Spot
- Current Draw: 11mA
- Testing Conditions
- All knobs set to 50%, switch set to "UP"





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